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FEED CENTER

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(54) [Title of the Invention]

POWDER COATING FEEDING DEVICE

(57) [Abstract]

PROBLEM TO BE SOLVED: To easily execute a color changeover of a powder coating with a small floor space and a simple structure.

SOLUTION: A supply of the powder coating is executed by inserting a bottom end part 3a of a suction nozzle 3 hung from a ceiling part 2 of the main body frame 1 into an inside of the powder coating in a coating tank 9 by raising the coating tank 9 carried on a vibrating table from a front opening part of a main body frame 1 with an up and down lifter 5. At the time of the color changeover, the inner surface of the suction nozzle 3 is cleaned with an air blow from an inner surface purge nozzle 11 raising an up-and-down frame 5 in a state in which the coating tank 9 is not carried.

[Scope of the Patent Claim(s)]

[Claim 1] Powder coating feeding device, characterized in that it is provided with:

a main body frame which opens outward at the front for the purpose of receiving a coating tank loaded with a powder coating from the front,

a suction nozzle installed pointing downward on the inside of the top of the foregoing main body frame,

a feeder which is connected to the foregoing suction nozzle for the purpose of feeding the powder coating to a powder coating gun by sucking it up through the bottom end part of the foregoing suction nozzle,

an up-and-down lifter which is placed in a lower section of the foregoing main body frame and raises and lowers the coating tank placed below the foregoing suction nozzle while holding said tank,

an inner surface purge nozzle which is installed pointing upward on the foregoing up-and-down lifter and directly below the foregoing suction nozzle for the purpose of cleaning the inner surface of the foregoing suction nozzle with blown air, and

a dust collector to suck up the dust which floats in the foregoing main body frame;

in that, at the time of feeding the powder coating, the bottom end part of the foregoing suction nozzle is inserted into the powder coating in the coating tank by raising the coating tank with the foregoing up-and-down lifter; and in that, at the time of changing the color, the inner surface of the foregoing suction nozzle is cleaned by the foregoing inner surface purge nozzle by raising the foregoing up-and-down frame without carrying the coating tank.

[Claim 2] Powder coating feeding device as described in Claim 1, characterized in that the aforesaid up-and-down lifter has a vibrating table to hold the coating tank and to vibrate the coating tank.

[Detailed Description of the Invention]

[0001]

[Technical Field of the Invention]

The present invention pertains to a powder coating feeding device which feeds a powder coating to a powder coating gun and, in particular, to a powder coating feeding device in which the color of the powder coating can be changed easily.

[0002]

[Conventional Techniques]

The powder coating process was developed as an environment-friendly pollution-free coating method in that no solvents are used. In this powder coating process, a powder coating sucked from a coating tank via a coating conveying hose is fed to a powder coating gun, sprayed from the powder coating gun onto a workpiece, and allowed to accumulate on the surface of the workpiece.

[0003] A conventional system for changing colors in this powder coating process is shown in Figure 5. Dedicated feeders 53 and 54 are provided separately to coating tanks 51 and 52 for powder coatings of color A and color B, respectively, and a color changer 57 is connected to these feeders 53 and 54 via corresponding coating conveying hoses 55 and 56, respectively. A coating gun 59 is connected to the color changer 57 via a common coating conveying hose 58. Furthermore, both feeders 53 and 54 are connected electrically to a controller (not shown in the figure) via a tank selector 60.

[0004] The purpose of the color changer 57 is to mechanically connect one of the coating conveying hoses 55 and 56 to the common coating conveying hose 58 and the purpose of the tank selector 60 is to electrically connect one of the feeders 53, 54 for coating tank 51 or for coating tank 52 to the controller.

[0005] For example, when carrying out coating of color A, tank selector 60 and color changer 57 are set so as to select feeder 53 and coating conveying hose 55 which correspond to coating tank 51. If feeder 53 is operated in this state, the powder coating of color A in coating tank 51 is fed to coating gun 59 via the color changer 57 and common coating conveying hose 58, then sprayed from the coating gun 59 onto a workpiece.

[0006] On the other hand, when changing the color from color A to color B, the color A powder coating stuck to the common coating conveying hose 58 and coating gun 59 is cleaned off, then tank selector 60 and color changer 57 are reset to select feeder 54 and coating conveying hose 56 which correspond to coating tank 52 of color B, then feeder 54 is operated in this condition by the controller. In this way, the color B powder coating in coating tank 52 is fed to the coating gun 59 via coating conveying hose 56, color changer 57, and

common coating conveying hose 58.

[0007]

[Problems to be Solved by the Invention]

The change in color can be accomplished in this manner, but the number of coating tanks, feeders, and coating conveying hoses must be the same as the number of colors, plus the fact that a color changer and tank selector are needed. In other words, conventional systems take up a lot of floor space, and because the whole color change system tends to become large and complicated, the production costs are increased. The present invention was developed to solve these problems, and is aimed at providing a powder coating feeding device which can easily change the color of a powder coating. Furthermore, the invention is uncomplicated and only takes up a small amount of floor space.

[0008]

[An Approach to Solving the Problems]

The powder coating feeding device of the present invention has a main body frame which opens outward at the front for the purpose of receiving a coating tank loaded with a powder coating from the front, a suction nozzle installed pointing downward on the inside of the top of the main body frame, a feeder which is connected to the suction nozzle for the purpose of feeding the powder coating to a powder coating gun by sucking it up through the bottom end part of the suction nozzle, an up-and-down lifter which is placed in a lower section of the main body frame and raises and lowers the coating tank placed below the suction nozzle while holding said tank, an inner surface purge nozzle which is installed pointing upward on the up-and-down lifter and directly below the suction nozzle for the purpose of cleaning the inner sur-

face of the suction nozzle with blown air, and a dust collector to suck up the dust which floats in the main body frame. At the time of feeding the powder coating, the bottom end part of the suction nozzle is inserted into the powder coating in the coating tank by raising the coating tank with the up-and-down lifter. At the time of changing the color, the inner surface of the suction nozzle is cleaned with the inner surface purge nozzle by raising the up-and-down frame without carrying the coating tank.

[0009] Furthermore, a vibrating table to hold the coating tank and to vibrate the coating tank can be installed on the up-and-down lifter.

[0010]

[Embodiment of the Invention]

An embodiment of the present invention will now be described based on the attached figures. Figure 1 shows a perspective view of a powder coating feeding device according to one embodiment of the present invention. The main body frame 1 has the approximate shape of a box, and opens outward to the front. A total of six suction nozzles 3 are installed on the ceiling part 2 of the main body frame 1 so as to point vertically downward. These suction nozzles 3 are arranged in two rows, three in each row, from the front to the back of the main body frame 1, and an opening is formed in the bottom end part 3a of each suction nozzle 3. The top end part of each suction nozzle 3 is connected to a feeder 4 placed on top of the ceiling part 2 of the main body frame 1, and moreover connected to a coating gun via a coating conveying hose (not illustrated).

[0011] The structure of a powder coating feeding device according to the present invention will be described in detail with the use of Figures 2-4. A common bed 6 fixed horizontally on an up-and-down lifter 5 is disposed in the

lower section of the main body frame 1, and the common bed 6 is built so as to be freely movable up and down by the up-and-down lifter 5. Two plateveyors 7 are arranged on the common bed 6 in parallel with each other from the front to the back of the main body frame 1, and installed so as to be freely raised and lowered with respect to the common bed 6 by a respective corresponding cylinder 8. A plurality of ball bearings 10 to convey a coating tank 9 is fixed to each plateveyor 7. Moreover, inner surface purge nozzles 11 are provided in the common bed 6, each pointing upward at locations directly below each suction nozzle 3. These inner surface purge nozzles 11 are connected to an air feeding device (not illustrated). In the front section of the common bed 6, a tank stopper 13 is provided, which is moved up and down by a cylinder 12. Moreover, vibrating table 15 is disposed on the common bed 6 via a vibration isolating rubber 14 and a vibrator 16 is attached to the back end of the vibrating table 15.

[0012] The vibrating table 15 is provided with opening parts at locations directly above the ball bearings 10 of each plateveyor 7 and the tank stopper 13, so that the leading ends of the ball bearings 10 and the tank stopper 13 protrude above the vibrating table 15 when they move upward. Openings are also formed in the vibrating table 15 at locations directly above the inner surface purge nozzles 11, so that each inner surface purge nozzle 11 comes close to or into contact with the bottom end part 3a of the corresponding suction nozzle 3 through the opening in the vibrating table 15, or can be inserted in the bottom end part 3a of the suction nozzle 3.

[0013] A dust collector 18 with a wall surface 17 provided with a large number of dust collecting holes is disposed at the rear of the main body frame 1. Furthermore, an operating panel 19 to operate the powder coating feeding

device is provided in an outside section of the main body frame 1.

[0014] The operating of the powder coating feeding device according to this embodiment will now be explained. First, the up-and-down lifter 5 is lowered to the lowest level and the plateveyors 7 are moved upward by extending the cylinders 8 by operation of the operating panel 19. At this point, each ball bearing 10 on the plateveyors 7 protrudes above the vibrating table 15 via the openings of the vibrating table 15. In this condition, the coating tank 9 loaded with a powder coating of the color to be applied is carried in from the front of the main body frame 1 onto the vibrating table 15. The coating tank 9 is carried in smoothly, riding on the ball bearings 10. Furthermore, a corrugated carton containing a coating delivered from a coating manufacturer can also be used as-is as the coating tank 9.

[0015] Next, the plateveyors 7 are lowered by the cylinders 8 until the ball bearings 10 sink below the vibrating table 15, and in this way the coating tank 9 is placed on the vibrating table 15, then the cylinder 12 is extended so the tank stopper 13 protrudes above the vibrating table 15. This can prevent the position of the coating tank 9 from shifting on the vibrating table 15, even if the vibrating table 15 is vibrated by operating the vibrator 16.

[0016] After the coating tank 9 is placed in this way on the vibrating table 15, the up-and-down lifter 5 is raised until the bottom end part 3a of each suction nozzle 3 is inserted in the powder coating in the coating tank 9, as shown by the virtual lines in Figures 2 and 3. In this condition, the vibrator 16 and each feeder 4 are operated, whereby the powder coating in the coating tank 9 is sucked up through the bottom end part 3a of the suction nozzle 3 and fed to coating guns (not illustrated).

[0017] At the time of changing the color of the coating, the up-and-down lifter 5 is lowered to the lowest level and the plateveyors 7 are raised, whereby the coating tank 9 is held on the ball bearings 10 and carried out from the front of the main body frame 1. The up-and-down lifter 5 is then raised to a level such that the coating tank 9 is not placed on the vibrating table 15. Because the inner surface purge nozzles 11 are provided in the common bed 6, each pointing upward at locations directly below each suction nozzle 3, the top end part of the inner surface purge nozzle 11 can be brought into contact with the bottom end part 3a of the respective corresponding suction nozzle 3 by raising the up-and-down lifter 5. If high-pressure air is fed from an air feed device (not illustrated) to each inner surface purge nozzles 11 in this state, the high-pressure air from the inner surface purge nozzles 11 will reach the coating guns (not illustrated) via the suction nozzle 3, feeders 4, and coating conveying hoses (not illustrated), and sprayed out of the coating guns as a jet. This high-pressure air that is supplied will blow away powder coating that is stuck to the interior of the suction nozzles 3, feeders 4, coating conveying hoses, and coating guns. The inner surface purge nozzles 11 can also be arranged so that they can be inserted in the bottom end part 3a of the corresponding suction nozzles 3. Moreover, the high-pressure air can even be fed into the suction nozzle 3 by just bringing the inner surface purge nozzle 11 close to the bottom end part 3a of the corresponding suction nozzle.

[0018] Furthermore, the outside of the suction nozzles 3 is cleaned with blown air simultaneously or almost simultaneously with the blown air from the inner surface purge nozzles 11, while running the dust collector 18 installed at the rear of the main body. At that time, the dust collector 18 is being

operated and hence dust such as the powder coating blown from the outside of the suction nozzles 3 by the blown air and floating in the main body frame 1 is sucked into the dust collector 18 through dust collecting holes in the wall surface 17 at the rear of the main body frame 1, thus preventing any scattering of the dust outside the main body frame 1.

[0019] After cleaning is thus completed, a new coating tank loaded with a powder coating of the color to be applied next is carried inside the main body frame 1, and the above-mentioned coating is carried out.

[0020] As described above, the powder coating feeding device according to the present invention requires no color changer and tank selector, and can easily meet the need for multicolor coating by just exchanging the coating tank for a single powder coating feeding device.

[0021] Furthermore, although six suction nozzles 3 are provided in the above-mentioned embodiment, this is not the only choice; for example, 10 suction nozzles may be installed in accordance with 10 coating guns.

[0022] Moreover, although the conveyance path for the coating tank 9 was formed by raising the plateveyors 7 provided with a plurality of ball bearings 10 by cylinders 8, a belt-like member with a smooth surface can be formed from a resin, a metal, or the like, and this belt-like member can be stuck on the vibrating table 15 along the front-to-back direction with respect to the main body frame 1, and the coating tank 9 can be conveyed by sliding it on the belt-like member. If a belt-like member of this kind is used, the structure of the powder coating feeding device becomes even simpler.

[0023] In the above-mentioned embodiment, the dust collector 18 is installed at the rear of the main body frame 1, but it can also be installed in a side section of the main body frame 1.

[Brief Description of the Figures]

[Figure 1] A perspective view which illustrates a powder coating feeding device according to one embodiment of the present invention.

[Figure 2]. A side view which illustrates the powder coating feeding device according to said embodiment.

[Figure 3] A front view which illustrates the powder coating feeding device according to said embodiment.

[Figure 4] A top view which illustrates the powder coating feeding device according to said embodiment.

[Figure 5] A diagram which illustrates a conventional color change system.

[Description of the Symbols]

(1) main body frame; (2) ceiling part; (3) suction nozzle; (3a) bottom end part; (4) feeder; (5) up-and-down lifter; (11) inner surface purge nozzle; (15) vibrating table; (18) dust collector; and (19) operating panel.

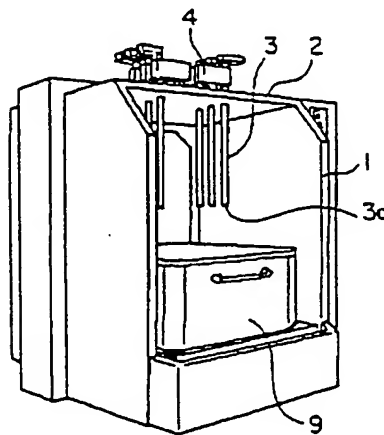


Figure 1.

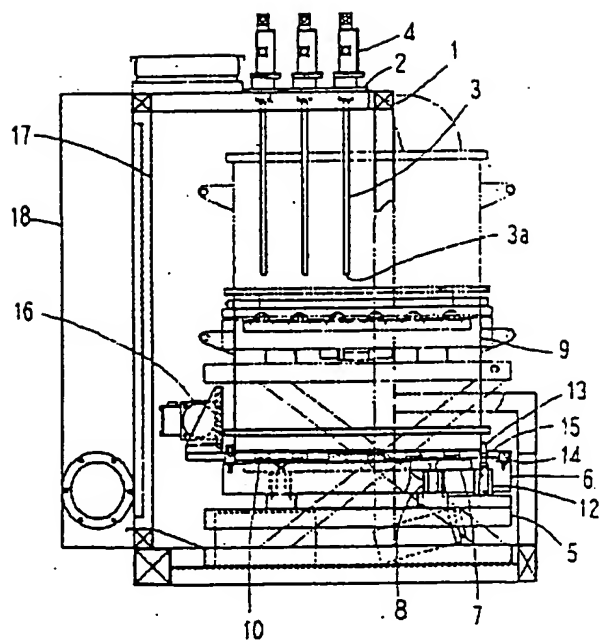


Figure 2.

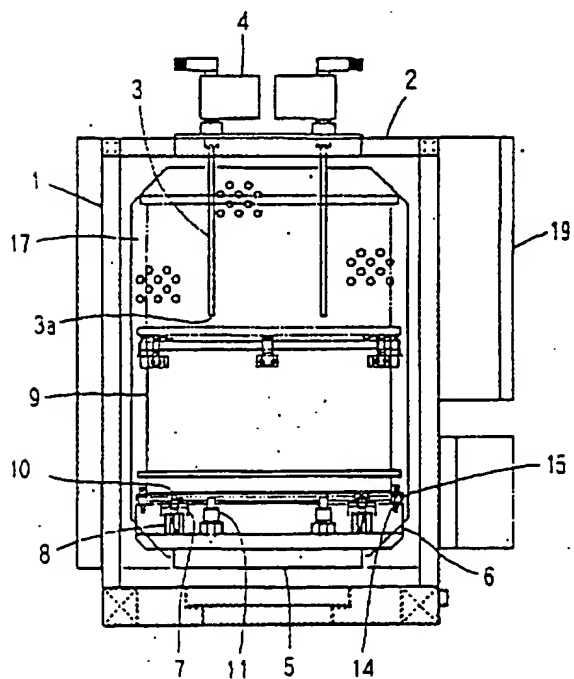


Figure 3.

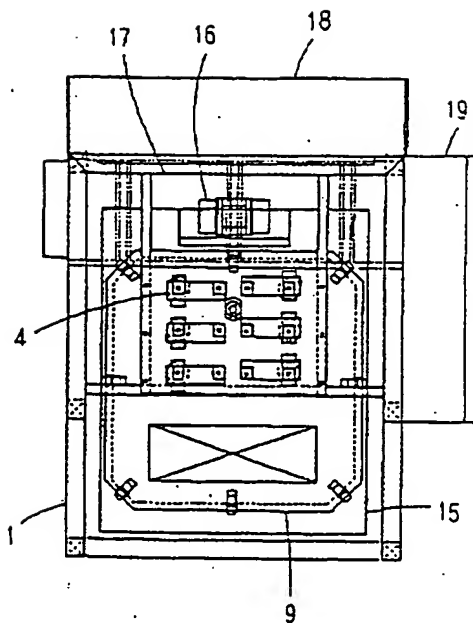


Figure 4.

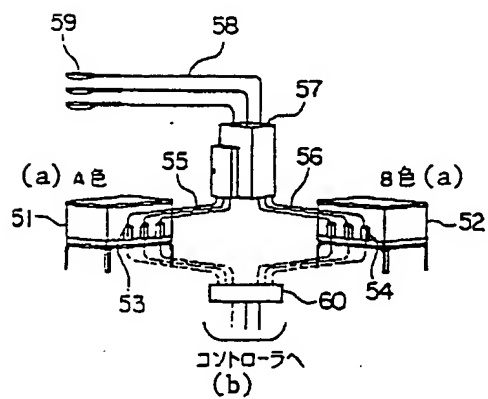


Figure 5. KEY: (a) color; and (b) to the controller.



AUSLEGESCHRIFT 1 087 520

P 19079 XI/81e

ANMELDETAG: 7. AUGUST 1957

BEKANNTMACHUNG
DER ANMELDUNG
UND AUSGABE DER
AUSLEGESCHRIFT:

18. AUGUST 1960

1

Die Erfindung betrifft eine Vorrichtung zum pneumatischen Fördern von schüttfähigem Gut, wie Zement, Mehl usw., die nach dem bekannten Doppelkolbenprinzip arbeitet. Es wurde schon vorgeschlagen, pulverförmiges Gut mittels Kolben-, Kreisel- oder Schlauchpumpen zu fördern. Bekannt ist ferner, in einen Pumpenzylinder Luft durch einen luftdurchlässigen Einsatz einzuführen, um schüttfähiges Gut fließfähig zu machen. Diese bekannten Vorrichtungen haben jedoch durch die direkte Berührung des Fördergutes mit den Arbeitselementen einen großen Verschleiß und arbeiten nicht störungsfrei. Auch wird hierbei empfindliches Gut beschädigt.

Diese Nachteile werden gemäß der Erfindung vermieden, da hierbei das Fördergut mit den Arbeitselementen nicht in Berührung kommt. Das Ansaugen und Austreiben des Gutes erfolgt erfindungsgemäß über zwischen den Kolben und dem Förderraum vorgesehene, an sich bekannte poröse Mittel, die in Form von Einsätzen beiderseits des Materialeinlasses angeordnet sind und für die Gewebe, keramisches Steinmaterial oder Sintermetall verwendet werden kann. Die Lage der porösen Einsätze in dem Zylinder kann verändert werden, so daß die Vorrichtung gleichzeitig zum Dosieren verwendbar ist.

Beim Ansaughub wird in dem zwischen den beiden Kolben gebildeten Raum ein Unterdruck erzeugt, wodurch Fördergut und Luft angesaugt werden. Hierbei verbleibt das Gut in dem durch die porösen Einsätze begrenzten mittleren Raum, während die Luft auch die porösen Einsätze durchdringt und die gesamten von den Kolben gebildeten Räume ausfüllt. Kurz vor der oberen Totpunktlage der Kolben werden Schlitze freigegeben, die die Räume mit der Außenluft verbinden und so einen Luftausgleich mit dieser ermöglichen. Beim Förderhub werden die Schlitze durch die Kolbenbewegung überdeckt, die Verbindung zur Außenluft wird unterbrochen, so daß die Luft durch die porösen Einsätze in den Förderraum gedrückt, das im Förderraum befindliche Gut aufgelockert und in eine Emulsion verwandelt wird. Diese Emulsion gelangt sodann in die Entleerungsleitung. Gleichzeitig werden hierbei die dem Förderraum zugekehrten Flächen der porösen Einsätze gereinigt.

Um eine kontinuierliche Förderung zu erzielen, können zwei oder mehr Zylinder nebeneinanderstehend oder -liegend zu einem Aggregat vereinigt sein, deren Kolben in an sich bekannter Weise angetrieben und gesteuert werden.

In der Zeichnung ist als Ausführungsbeispiel eine aus zwei Zylindern bestehende Fördervorrichtung schematisch dargestellt. Es zeigt

Fig. 1 einen Längsschnitt,

Fig. 2 einen Schnitt gemäß der Linie A-B,

Vorrichtung zum pneumatischen Fördern von schüttfähigem Gut

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2

Fig. 3 einen Schnitt gemäß der Linie C-D.

Die Vorrichtung besteht aus den beiden nebeneinander angeordneten Zylindern 1 mit den Kolbenpaaren 2, die durch zwei mehrfach gekröpfte Wellen 3 derart angetrieben werden, daß abwechselnd die Kolbenpaare gegeneinandergeführt werden. Der zwischen je einem Kolbenpaar gebildete Förderraum 4 ist durch zwei beiderseits des Materialeinlasses angeordnete poröse Einsätze 5 begrenzt. Die Einsätze können verstellbar gelagert werden, wodurch das Volumen des Förderraumes beliebig verändert werden kann, so daß die Vorrichtung gleichzeitig zum Dosieren verwendbar ist. An den Förderraum sind eine Zuleitung 6 mit einem Ventil 7 und eine Entleerungsleitung 8 mit einem Ventil 9 angeschlossen. Die Ventile werden durch den von den Kolben ausgeübten Druck bzw. Sog betätigt. Im Hubraum eines jeden Zylinders ist ferner ein Schlitz 10 für den Lufteinlaß vorgesehen.

Arbeitsweise

Nach der oberen Totpunktlage der beiden Kolben eines Zylinders öffnet sich das Entleerungsventil 9. Werden nun die Kolben gegeneinandergeführt, so wird die durch die Schlitze 10 beim Druckausgleich eingeströmte Luft durch die porösen Einsätze 5 in den Förderraum 4 gedrückt, wodurch eine Emulsion aus Gut und Luft erzeugt und über das geöffnete Ventil 9 in die Entleerungsleitung 8 gedrückt wird. Beim Rückwärtsgang der Kolben in die obere Totpunktlage schließt sich das Ventil 9. Es entsteht durch die Rückwärtsbewegung der Kolben im Förderraum ein Unterdruck, durch den das Einlaßventil 7 geöffnet wird und das Fördergut aus der Leitung 6 eingesaugt wird.

PATENTANSPRUCHE:

1. Vorrichtung zum pneumatischen Fördern von schüttfähigem Gut aller Art mittels einer Pumpe,

3

deren Förderraum von zwei in einem Zylinder gegenläufig geführten Kolben gebildet wird, an den eine mit je einem Ventil versehene Aus- und Einlaßleitung angeschlossen sind, dadurch gekennzeichnet, daß der Förderraum mittels poröser Einsätze (5) begrenzt ist, die beiderseits des Materialeinlasses angeordnet sind.

2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Lage der porösen Einsätze (5) im Zylinder veränderbar ist.

3. Vorrichtung nach Anspruch 1 und 2, dadurch gekennzeichnet, daß die Einsätze (5) aus Sintermetall bestehen.

4. Vorrichtung nach Anspruch 1 bis 3, dadurch gekennzeichnet, daß mehrere Vorrichtungen zu 15

4

einem Aggregat vereinigt sind, die gemeinsam angetrieben werden.

5. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß in den Zylinderwandungen, die die Räume zwischen den Kolben (2) und den porösen Einsätzen (5) umschließen, im Bereich des oberen Totpunktes der Kolben nach außen führende Schlitze (10) vorgesehen sind.

In Betracht gezogene Druckschriften:
 Deutsche Auslegeschrift D 18348 XI/81 e (bekanntgemacht am 22. 9. 1955);
 französische Patentschrift Nr. 318 239;
 britische Patentschrift Nr. 612 089;
 USA.-Patentschrift Nr. 2 667 280.

Hierzu 1 Blatt Zeichnungen

